

CALYSTEGIA R.BR. (CONVOLVULACEAE) IN WESTERN AUSTRALIA

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ABSTRACT

The genus *Calystegia* (Convolvulaceae) is represented by two native species in Western Australia, *Calystegia soldanella* and *C. sepium*. The latter had not been collected in Western Australia since 1877 until a population was discovered near Busselton in 2008. This was initially considered a weed and highlights the need for careful study of difficult cosmopolitan wetland groups.

INTRODUCTION

Western Australia has two recorded native species of *Calystegia* R.Br. namely *C. soldanella* (L.) Roem. & Schult. and *C. sepium* (L.) R.Br. The former is a rarely recorded plant of coastal fore dunes, while the latter is not represented in collections at PERTH, however, There are six nineteenth century Western Australian collections in Melbourne (MEL) Herbarium. No other collections have been located in Australian Herbaria.

While undertaking surveys of reserves and bushland areas in the Busselton region as part of a

conservation plan for the region (Webb *et al.* 2009) a large population of an unknown sterile vine was located in the Broadwater Nature Reserve. When flowering material became available (Figures 1 and 2) this was collected and identified as a pink flowered member of the genus *Calystegia* (Convolvulaceae).

While the genus is distinctive, species of the genus *Calystegia* are difficult to identify. Fang and Brummitt (1995) note that the genus *Calystegia* comprises

“Approximately 70 intergrading sub specific taxa which can be arbitrarily



combined into about 25 species: mostly temperate but sparingly extending to the tropics. Nearly all taxa in *Calystegia* intergrade geographically into neighbouring taxa with the exception of the widespread coastal species, *C. soldanella* (Linnaeus) R. Brown. Almost half of the genus is endemic

LEFT: Figure 1. Flower of *Calystegia sepium* subsp. *roseata* at Broadwater Nature Reserve

BELOW: Figure 2. Habit of *Calystegia sepium* subsp. *roseata* at Broadwater Nature Reserve



in California, U.S.A. It is impossible to draw clearly defined specific limits, and intermediate forms are always found where two taxa approximate geographically”.

On checking keys and floras, the population at Broadwater fell into the *Calystegia sepium/silvatica* complex, a sub-cosmopolitan species group centred on the Northern Hemisphere. This species complex consisting of *C. sepium* (Table 1) with nine described subspecies, *C. silvatica*, *Calystegia pulchra* (a species that is probable horticultural derivative), and two other species which are named hybrid derivatives. Of these 13 taxa, five normally have pink flowers like

the Broadwater population (Table 1).

Plants from Broadwater were compared and contrasted using the descriptions and keys to these pink flowered taxa (Lockton 2012, Stace and Hilli Thompson 1997, Stace, Van der Medjen and De Kort 2011). Broadwater plants despite having the large pink flowers , normally characteristic of *C. pulchra*, are completely glabrous and can therefore, be excluded from that species. They have overlapping inflated bracteoles which cover the base of the flower and hide the sepals. This is a key character in all recent keys and floras used to separate *C. silvatica* from *C. sepium*.

Table 1. Taxa in the *Calystegia sepium/silvaticum* complex (Source: Stace and Hilli Thompson (1997), Stace, Van der Medjen & De Kort (2011) and Webb, Sykes and Garnock-Jones (1988))

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- *Calystegia sepium* subsp. *americana*. North America (flowers white).
 - *Calystegia sepium* subsp. *angulata*. North America (flowers white).
 - *Calystegia sepium* subsp. *appalachiana*. Eastern North America (flowers white).
 - *Calystegia sepium* subsp. *binghamiae*. Western North America (California, flowers white).
 - *Calystegia sepium* subsp. *erratica*. North America (flowers white).
 - *Calystegia sepium* subsp. *limnophila*. Southern North America (flowers white).
 - *Calystegia sepium* subsp. *roseata*. Sub-cosmopolitan (flowers pink).
 - *Calystegia sepium* subsp. *sepium*. Sub-cosmopolitan (flowers white).
 - *Calystegia sepium* subsp. *spectabilis*. Siberia. (flowers often pinkish).
 - *Calystegia pulchra* (flowers pink).
 - *Calystegia silvatica* subsp. *disjuncta* Europe (flowers white).
 - *Calystegia silvatica* subsp. *fraterniflora* North America (flowers white).
 - *Calystegia silvatica* subsp. *orientalis* Asia (flowers white).
 - *Calystegia silvatica* subsp. *silvatica* Europe (flowers white).

Hybrid Taxa (both have pink flowers)

- *Calystegia* x *scania* (*C. sepium* x *pulchra*) UK
 - *Calystegia* x *howittorum* (*C. pulchra* x *silvatica*) UK
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However, the pink flowers and arrow shaped leaves are atypical of *C. silvatica*. Ogden (1978) noted that populations in New Zealand with this character set (pink flowers, overlapping saccate bracteoles with a deep sinus) were provisionally allocated as hybrids between these species. However, there is only one taxa present at Broadwater with no indication of either putative parent species and the population is the sole highly seed fertile, suggesting that it is not a hybrid swarm.

This rampant vine was thus provisionally identified as the weed *Calystegia ? silvatica* and targeted for eradication because of its invasive nature and potential impacts (Keighery and Keighery 2009).

However, because of the provisional nature of the identification, the knowledge that this is a group of intergrading species, that are difficult to accurately identify we continued to attempt to place the population more accurately. Melbourne Herbarium was visited to view existing Western Australian and exotic collections, we had discussions with New Zealand weed experts in Christchurch and sent scans of living and dried plants to Dr R. Brummitt at the Royal Botanic Gardens in Kew, England, the world authority on the genus. This study resulted in the re-assessment of this collection presented here.

CALYSTEGIA IN WESTERN AUSTRALIA

Five species of *Calystegia* are recorded in Australia (Table 2), including a naturalised weed, *Calystegia silvatica*. *Calystegia* in Western Australia is now considered to contain two indigen-

Table 2. *Calystegia* Species Recorded for Australia
(Source Australian Plant Census, 2011 <http://www.cpbr.gov.au/chah/apc/index.html>)

<i>Calystegia affinis</i> Endl. Lord Howe & Norfolk Islands
<i>Calystegia marginata</i> R.Br. Qld, NSW & Vic
<i>Calystegia sepium</i> (L.) R.Br. (WA, SA, NSW, Vic, Tas)
<i>Calystegia sepium</i> (L.) R.Br. subsp. <i>sepium</i> Only Vic and SA currently recognise subspecies in this species.
<i>Calystegia sepium</i> subsp. <i>roseata</i> Brummitt Vic, SA
* <i>Calystegia silvatica</i> (Kit.) Griseb. Only SA and Vic use subspecific rank in this species. SA (naturalised), NSW (naturalised), Vic (naturalised), Tas (naturalised)
* <i>Calystegia silvatica</i> (Kit.) Griseb. subsp. <i>disjuncta</i> Brummitt Vic (naturalised)
* <i>Calystegia silvatica</i> (Kit.) Griseb. subsp. <i>silvatica</i> SA (naturalised), Vic (naturalised)
<i>Calystegia soldanella</i> (L.) Roem. et Schult. WA, SA, Tas, Vic, NSW

ous species, one with possibly two subspecies.

Key to *Calystegia* in Western Australia

1. Trailing plants, leaves fleshy apex rounded *C. soldanella*
1. Twining plants, leaves not succulent with an acute tip... 2
2. Leaves mostly narrowly triangular with arrow shaped tails, flowers white
..... *C. sepium* subsp. *sepium*
2. Flowers pink
..... *C. sepium* subsp. *roseata*

A general description of the genus follows:

Calystegia R.Br.

Perennial herbs prostrate or erect to twining to several metres tall, rhizomatous [or woody at base]. Leaves subsessile to petiolate, oblong to hastate or sagittate [or rarely pedate]. Inflorescences axillary, 1-flowered [or few-flowered] cymes; bracteoles 2, sepal-like, inserted immediately below calyx, ovate and sometimes saccate, enclosing calyx [or remote from calyx and subulate or leaf-shaped], persistent. Sepals subequal, persistent. Corolla white, pink [or pale yellow], funnellform, with 5 distinct midpetaline bands, glabrous. Stamens included, equal. Pollen globose, pantoporate, not spiny. Ovary 1-loculed, 4-ovuled. Style 1, included in corolla; stigmas 2, clavate. Capsule globose, glabrous, indehiscent. Seeds 4, smooth or minutely tuberculate.

1. *Calystegia soldanella* (L.) Roem. & Schult.

Trailing perennial vine from a ?tuberous rootstock; glabrous. Leaves with lamina reniform to rounded-cordate, fleshy, 1.5–4 cm long, 2 to 4 cm wide; margins undulate; petiole 1–5 cm long. Flowers axillary, solitary on peduncles equal to or longer than petioles; bracteoles broad-ovate, obtuse, 1–1.5 cm long, 8–12 mm wide, slightly shorter than the calyx. Corolla 3–5 cm long, pink. Capsule ovoid, 12–15 mm long. Sea Bindweed.

Specimens examined. WESTERN AUSTRALIA: Mouth of Ellen Brook, 33° 54' 29" S 114° 59' 36"E, 2-Oct.-1988, G.J. Keighery 10506 (PERTH 04431901), Mouth of Ellen Brook, 33° 54' 29" S 114° 59' 36" E, 29-Jan.-1988, G.J. Keighery 9512 (PERTH 03641848), Opposite Chatham Island, 34° 58' 35" S 116° 43' 29" E, Dec.-1912, S.W. Jackson s.n. (PERTH 03634566).

Distribution. Recorded from the Warren bio-region of Western Australia. Also recorded from Queensland, New South Wales, Lord Howe Island, Norfolk Island, South Australia, Victoria and Tasmania.

Habitat. Occurs sporadically along upper margins of the strand line on beaches.

Flowering Period. October to January.

Conservation Status. Although it has been rarely recorded this species is probably not rare.

Notes. This is an uncommon sand binder of the higher rainfall region of southern Western Australia.

2. *Calystegia sepium* (L.) R.Br. ?

subsp. *sepium*

All the six individual historical collections from Melbourne Herbarium (MEL) lack any description of flower colour, however, the rather faded flowers on existing herbarium collections lack any pink shades. *Calystegia sepium* subsp. *roseata* is almost always noted as a weedy component of coastal often saline wetlands rather than the riverine habitats of these collections which are the preferred habitat of subspecies *sepium*. Hence they are provisionally attributed to subspecies *sepium*.

Perennial vine from a widely spreading underground horizontal stem; shoots erect, slender, glabrous and twining on supporting vegetation to 5 metres. Leaves alternate with lamina arrow- or heart- shaped, 3–10 cm long, 2–6 cm wide, acuminate with an acute apex; base sagittate or slightly hastate; basal lobes entire to slightly lobed; petiole 2–5 cm long. Flowers axillary, solitary on peduncles much longer than petioles; bracteoles ovate, acute, 1.5–2 cm long, 8–12 mm wide, longer than and enclosing the calyx. Corolla 4–6 cm long, ?white. Capsule ovoid, 7–9 mm long. Large Bindweed.

Specimens examined (all MEL). WESTERN AUSTRALIA:, Tone

River, 100 miles west [climber sent to Mueller by Shepherd, Grows in channel on muddy deposits, inundated for a considerable time, flowers about January], MEL 2272160; Upper Warren River, 13-Dec.-1877, MEL 227215; Western Australia, Mrs. Clarke, MEL 2272154; Western Australia, Drummond 219, MEL 2272161; ?Tone or Toms Ranges, Mueller, MEL 2272152; Murchison River, Oldfield, MEL 2272153.

Distribution. Recorded from the Murchison River to the Tone River. *Calystegia sepium* subsp. *sepium* is also recorded from New South Wales, South Australia, Victoria and Tasmania. Elsewhere, temperate regions of Europe, Africa, Asia and America.

Habitat. Apparently confined to riverine sites.

Flowering Period. December to January.

Conservation Status. Although recorded at least six times in the Nineteenth century, from the Murchison to the Tone River, this species has not been collected since 1877. If this is *Calystegia sepium* subsp. *sepium* then this subspecies is probably extinct in Western Australia.

Notes. Considerable degradation by clearing, grazing, siltation and especially salination of the water has occurred along many Western Australia rivers and this may account for the decline and disappearance of this subspecies.

3. *Calystegia sepium* subsp. *roseata*
Brummitt

Perennial vine to 5 metres, from a ?tuberous rootstock, glabrous, with twining stems. Leaves with lamina ovate to lanceolate, 5–10 cm long, 5–10 cm wide, shortly acuminate with an apex acute or narrowly obtuse and finely mucronate; base cordate and shallowly sagittate; petiole 4–8 cm long. Flowers solitary on peduncles longer than petioles; bracteoles broad-ovate, 2–3 cm long, 12–16 mm wide, rounded to truncate, emarginate at the apex, longer than and enclosing the calyx, inflated at the base. Corolla 4–7 cm long, suffused pink. Capsule ovoid, 10–12 mm long. Seeds triangular-ovoid, very dark brown to almost black. Pink Bindweed.

Specimens examined. WESTERN AUSTRALIA: Broadwater Nature Reserve, 33° 39' 52"S 115° 18' 5.1" E, GJ & BJ Keighery 890 (PERTH 07852290).

Distribution. *Calystegia sepium* subsp. *roseata* in Australia has been recorded from South Australia, Victoria and Tasmania. The subspecies is also widespread in temperate areas of New Zealand, Europe and America.

Habitat. A rampant vine occupying a single wetland in the Busselton area (Broadwater Nature Reserve and along the New River). This is an area of fresh to saline coastal lagoonal wetlands which is the preferred habitat of this subspecies (Lockton 2012).

Flowering Period. October to December.

Notes. Despite Stace (1961) reporting that both *C. silvatica* and *C. sepium* are self-incompatible in Britain, the clone of this species at Broadwater produces a large amount of hard black-brown seeds.

Although the New Zealand Plant Conservation Network (2011) noted that fertile hybrids can readily occur between *Calystegia silvatica* and *sepium* especially in urban settings, they normally have pale pink-white striped flowers and both parents have very distinctive nrDNA ITS sequences from which the hybrid can be readily detected. Since only one taxon was detected at Broadwater the possibility that the population is of hybrid origin seems low. New Zealand experts were of the opinion that the collection fell within the limits of *C. sepium* and was probably not of hybrid origin.

The pink flowers (Figure 1) and normally narrow to broadly triangular green to yellow-green leaves with sagittate tails (giving an arrow shape, see Figure 2) also separate this population from the white flowered *Calystegia silvatica* which has broadly triangular to ovate dark green leaves without the tails.

R. Brummitt (pers. com.) considers that *Calystegia sepium* subsp. *roseata* is the correct placement of the population. He also noted that the habitat reflects the normal occurrences

of this subspecies and the population should be considered indigenous not alien.

DISCUSSION

With the new placement of the Busselton collection it becomes the first record of the species, *Calystegia sepium* in Western Australia since 1877. If the older records are indeed subspecies *sepium*, then this is also the first record of subspecies *roseata* from Western Australia, and subspecies *sepium* is probably extinct in Western Australia. That this was initially considered a weed highlights the need for careful study of difficult cosmopolitan wetland groups. Searches need to be undertaken for this species along the upper reaches of the Tone and Warren Rivers to ascertain if they still exist and if they are indeed subspecies *sepium*.

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